SINGLEVERSE THEORY

The Multi-Layer Singleverse

A TheoryLoop Research Paper

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1. Abstract

This paper proposes the *Singleverse*, a model in which the universe consists of multiple compressed layers of spacetime arranged within a single continuous structure. Unlike multiverse frameworks that posit separate, causally disconnected universes, the Singleverse describes a unified system composed of stacked, interacting layers that differ in temporal density, informational resolution, and dynamical behavior. The model draws conceptual parallels to brane cosmology, the holographic principle, block-universe formulations, and emergent-spacetime research, while remaining distinct in its treatment of layered compression and cross-layer influence. The theory suggests that physical laws may emerge from interactions between adjacent layers, and that certain quantum or cognitive phenomena may reflect sampling across these layers. The Singleverse is presented as a conceptual framework rather than a mathematical derivation; however, it outlines falsifiable predictions and potential observational signatures. The goal of this paper is to provide a coherent structure that invites mathematical formalization, empirical critique, and interdisciplinary exploration.

2. Introduction

Modern physics contains several frameworks that attempt to reconcile quantum mechanics, general relativity, and the nature of spacetime. These include M-theory and brane cosmology, which describe higher-dimensional structures; the holographic principle, which treats spacetime as emergent from boundary information; and block-universe models, which treat time as a static dimension. While these frameworks differ in assumptions and mathematical form, they share a common theme: the universe may possess structure beyond the observable 3+1 dimensions.

The Singleverse Theory builds on this theme by proposing that the universe is composed of *multiple compressed layers of spacetime* arranged within a single continuous system. Each layer contains its own temporal density and informational resolution, and the observable universe corresponds to one such layer. This model is motivated by conceptual parallels in theoretical physics and by findings such as the Blue Brain Project's identification of high-dimensional geometric structures in neural activity, which suggest that layered or multi-dimensional organization may be a natural feature of complex systems.

The purpose of this paper is to articulate the Singleverse as a coherent conceptual model, outline its internal logic, and propose testable implications that could guide future mathematical or empirical work.

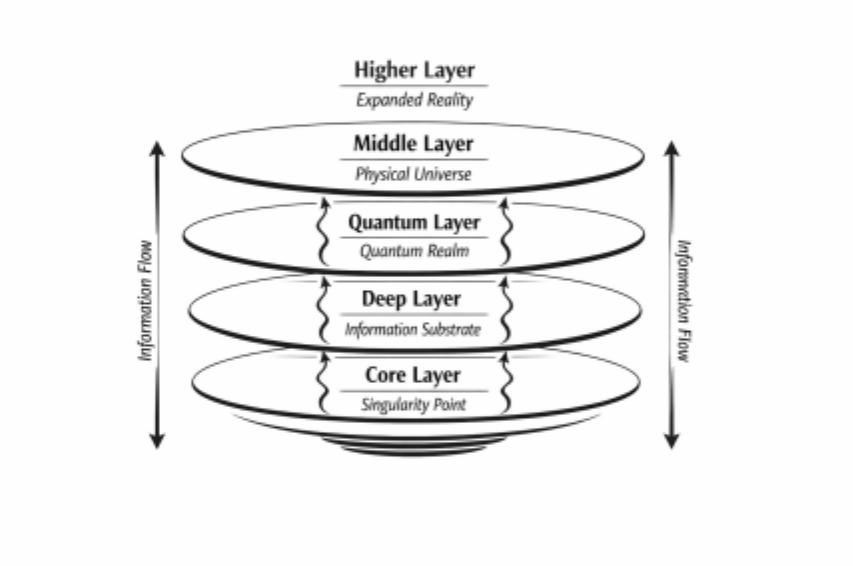
3. Model Description: The Multi-Layer Singleverse

3.1 Core Structure

The Singleverse consists of a finite or countably infinite set of spacetime layers, each representing a compressed version of the universe's full informational state. These layers are not parallel universes but *nested strata* within a single overarching structure. Each layer possesses:

- **Temporal density**: the rate at which time is experienced or encoded.
- **Informational resolution**: the granularity of physical detail.
- **Dynamical behavior**: the specific physical laws or constants that emerge at that layer's resolution.

Layers are arranged such that deeper layers contain more compressed representations of the universe's total information, while higher layers contain expanded or higher-resolution versions.



3.2 Layer Interaction

Adjacent layers may influence one another through boundary interactions. These interactions could manifest as:

- apparent quantum randomness
- decoherence behavior
- fluctuations in vacuum energy
- emergent classicality
- constraints on information flow

The model does not require direct causal transfer between layers; instead, it proposes that physical laws emerge from the equilibrium behavior of the layered structure.

3.3 Consciousness and Sampling (Optional Component)

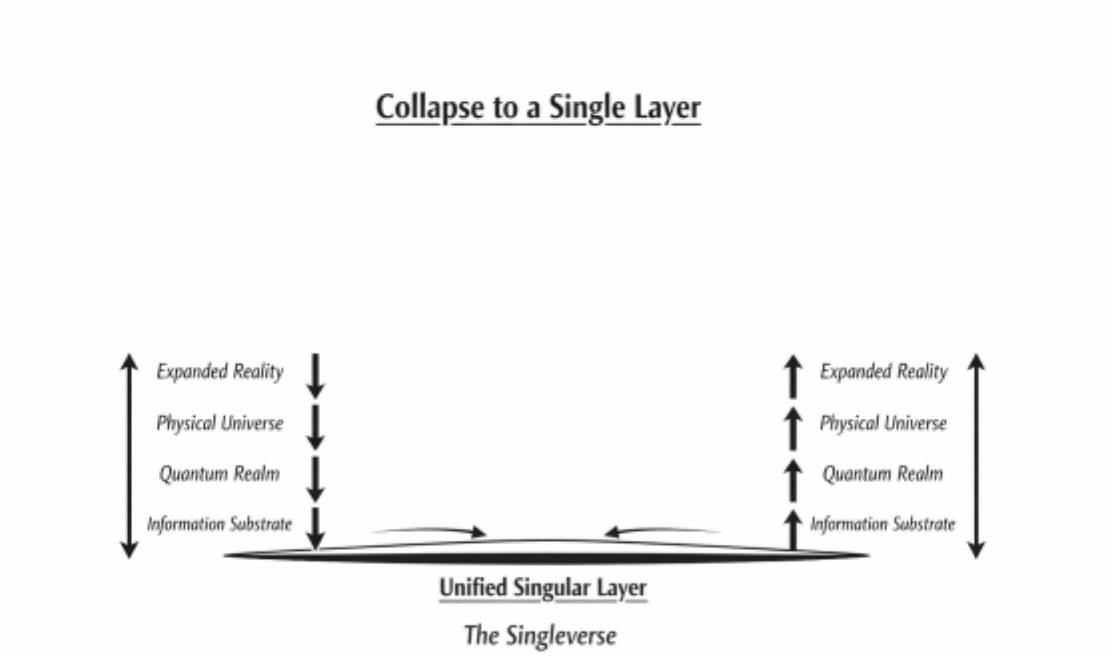
While not required for the physical model, the theory allows for the possibility that cognitive processes may sample across layers with different temporal densities. This is conceptually aligned with research on high-dimensional neural structures and does not assert any non-physical mechanism.

3.4 Distinction from Multiverse Models

The Singleverse differs from multiverse theories in that:

- all layers belong to one universe
- layers are structurally connected
- layers represent compressed states rather than separate realities
- cross-layer influence is possible in principle

This positions the Singleverse as a unification model rather than a branching or parallel-universe model.



4. Predictions and Falsifiability

4.1 Predictions

If the Singleverse model is correct, the following should hold:

1. **Quantum behavior should exhibit signatures of cross-layer influence**, such as structured randomness or correlations not fully explained by standard models.
2. **Spacetime geometry may show evidence of layered compression**, potentially detectable through anomalies in gravitational behavior or cosmological background patterns.
3. **Information-theoretic limits** (e.g., holographic bounds) should align with the idea of compressed layers rather than a single boundary surface.
4. **Cognitive or neural systems** may exhibit high-dimensional structures consistent with sampling across temporal densities.

4.2 Falsifiability

The theory would be falsified if:

- spacetime is shown to be strictly homogeneous with no layered structure
- quantum randomness is demonstrated to be purely stochastic with no deeper informational basis
- no possible mathematical formulation can represent layered compression without contradiction
- empirical data contradicts any predicted cross-layer effects

The model is conceptual but remains falsifiable in principle.

4.3 References

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